REMARKS

Claim 3 stands objected to for lack of antecedent basis of a limitation in the claim. In response to this objection claim 3 has been amended as set forth above. It is believed that the foregoing amendment to claim 3 overcomes this objection.

Claim 1 stands rejected under 35 U.S.C. § 102(b) for anticipation by U.S. Patent No. 4,168,212 to Faktor et al. Claims 2-8 stand rejected under 35 U.S.C. § 103(a) for obviousness from the various teaching of the Faktor et al. patent and U.S. Patent Nos. 6,492,827 to Mazur et al.; 6,069,485 to Long et al.; and 4,621,233 to Davari et al.

In rejecting claim 1 under 35 U.S.C. § 102(b), the Examiner asserts that the Faktor et al. patent discloses "a probe (13) having an electrically conductive tip and an electrical insulator covering at least a distal end of the conductive tip; means (21) for applying a capacitive-voltage (CV) type electrical stimulus between the electrically conductive tip (13) and a semiconductor wafer (18) when the electrical insulator is in contact with the semiconductor wafer". Applicant respectfully traverses these assertions.

Column 6, lines 21-23 of the Faktor et al. patent disclose that the reference electrode 13 is a saturated calomel electrode of the porous plug type. Attached hereto as Exhibit A is a reference that clearly shows that a saturated calomel electrode does not have an electrically conductive tip (See Figs. 6a and 6b on page 639 of Exhibit A). Absent having an electrically conductive tip, the saturated calomel electrode simply has no need for an electrical insulator covering at least a distal end of the conductive tip. Hence, the Faktor et al. patent does not disclose a probe having an electrically conductive tip and an electrical insulator covering at least a distal end of the conductive tip.

The Faktor et al. patent also discloses that electrode 14 is in contact with an electrolyte in a passage 1 of an electrolytic cell 18. Hence, the Faktor et al. patent does not disclose the limitation of claim 1 that a CV type electrical stimulus is applied between the electrically conductive tip and a semiconductor wafer when the electrical insulator of the probe is in contact with the semiconductor wafer. To this end, since, as noted above, the electrode 13 disclosed in the Faktor et al. patent does not include an electrical insulator covering at least the distal end of the conductive tip of the probe, the Faktor et al. patent cannot disclose, teach or

suggest that such electrical insulator is in contact with anything, much less a semiconductor wafer, when the CV type electrical stimulus is applied between the conductive tip and the semiconductor wafer.

Absent disclosing an apparatus having all the limitations of claim 1, the Faktor et al. patent cannot anticipate or render obvious claim 1, and claims 2-8 dependent therefrom.

Regarding the rejection of claim 2 under 35 U.S.C. § 103(a), Applicant traverses the Examiner's assertion that it would have been obvious to one of ordinary skill in the art at the time of the invention to determine the doping concentration for a near surface region of the semiconductor wafer adjacent the electrical insulator. Specifically, the addition of the electrical insulator covering at least the distal end of the conductive tip avoids the conductive tip from coming into direct contact with exposed semiconducting material or a dielectric or insulating layer overlaying the semiconducting material of the semiconductor wafer. By avoiding this direct contact, a direct electrical connection between the conductive tip and the semiconducting wafer is avoided whereupon disruption in the measurement of doping concentration in the near surface region of the semiconductor wafer is avoided. Avoiding such disruption extends the spatial resolution of the measurement and enables doping concentration for the near surface region of the semiconductor wafer to be determined.

Regarding the rejection of claim 5 under 35 U.S.C. § 103(a), in the present invention, the MOS type junction is formed when the electrical insulator is in contact with the semiconductor wafer. Hence, in the present invention, moving the electrical insulating portion of the probe into contact with the semiconductor wafer dynamically forms the MOS type junction. In contrast, the Long et al. patent discloses a fabricated, permanent MOS type junction, wherein gate 14 is permanently attached to an insulating layer 60. Gate 14 in the Long et al. patent is clearly not a probe in the sense of the present invention.

CONCLUSION

Based on the foregoing amendments and remarks, reconsideration of the objection and rejections, and allowance of claims 1-8 are requested.

Respectfully submitted,

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EXPERIMENTS
IN PHYSICAL
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pH METER

A pH meter is a special type of millivolt potentiometer designed to measure the emf of a cell in which the electrolyte contains hydrogen ions. A "glass electrode" is employed as the measuring electrode, and a calomel electrode is used as the reference electrode.

Calomel electrode[9] In addition to pH measurements there are many other emf cell measurements for which it is convenient to use the calomel electrode as a reference electrode against which a measuring electrode is compared. Actually, this "electrode" is really a half-cell which is connected via a KCl salt bridge to another half-cell containing the solution of interest. The *saturated* calomel electrode can be written as

$$Hg(l) + Hg_2Cl_2(s),\ K^+Cl^-(aq,\ \text{sat.}),\ \text{aq. electrolyte} \tag{5}$$

There are two other common versions of this half-cell: the *normal* and *tenth-normal* calomel electrodes, in which the KCl concentration is either 1.0 or 0.1 N. The saturated electrode is the easiest to prepare and the most convenient to use but has the largest temperature coefficient. The half-cell potential for each of the calomel electrodes has a different value relative to the standard hydrogen electrode; these emf values are given in Table 1. Calomel electrodes can be easily prepared in the laboratory and are also available commercially. Two typical calomel electrode designs are shown in Fig. 6.

Table 1 HALF-CELL POTENTIALS OF CALOMEL REFERENCE ELECTRODES[a]

KCl conc.	Potential at 25°C, V
0.1N	−0.3338
1.0N	−0.2800
Saturated	−0.2415

[a] W. J. Hamer, *Trans. Electrochem. Soc.*, 72, 45 (1937).

Glass electrode[10] This electrode is usually a silver–silver chloride electrode, surrounded by a thin membrane of a special glass which is permeable to hydrogen ions. The glass membrane is essentially a special type of salt bridge—one in which the anions are immobile (have zero transference number), since they are part of the porous glass framework through which the H^+ cations can move. The glass electrode

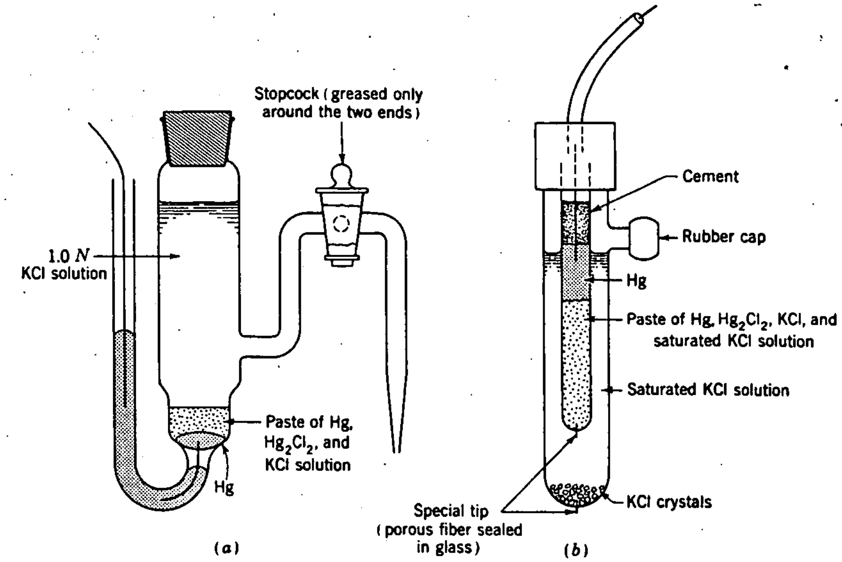

FIGURE 6
Two typical calomel electrode designs: (*a*) laboratory type, shown unsaturated; (*b*) commercial type, shown saturated.

may be formulated as

$$Ag(s) + AgCl(s),\ H^+Cl^-(aq,\ a_0),\ H^+(\text{glass})^-,\ \text{aq. electrolyte containing } H^+ \text{ at activity } a_{H^+} \tag{6}$$

The change in state per faraday for this half-cell is thus

$$Ag(s) + Cl^-(a_0) + H^+(a_0) = AgCl(s) + H^+(a_{H^+}) + e^- \tag{7}$$

The activity a_0 has a definite constant value, usually obtained by using 0.1 M HCl as the solution inside the membrane. An important advantage of the glass electrode is that it can be used under many conditions for which the hydrogen electrode is subject to serious error.[11]

pH measurement[11] The overall emf for a cell with a calomel and a glass electrode dipping into an aqueous electrolyte solution is

$$\mathscr{E} = \mathscr{E}' - \frac{RT}{\mathscr{F}} \ln a_{H^+} = \mathscr{E}' + \frac{2.303RT}{\mathscr{F}} (\text{pH}) \tag{8}$$